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*May 06, 2005*

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**APPLICATION NUMBER:** *60/559,350*
**FILING DATE:** *April 02, 2004*
**RELATED PCT APPLICATION NUMBER:** *PCT/US05/11387*

UNITED STATES PATENT AND TRADEMARK OFFICE
DEPARTMENT OF COMMERCE

Certified by

Jon W. Dudas

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

16085 U.S. PTO

22264 U.S. PTO 60/559350





# PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EV313042197US

| INVENTOR(S) | | |
|---|---|---|
| Given Name (first and middle [if any]) | Family Name or Surname | Residence (City and either State or Foreign Country) |
| Dan G. | SIEGEL | Belleville, IL |

*Additional inventors are being named on the* ____________ *separately numbered sheets attached hereto*

**TITLE OF THE INVENTION (500 characters max)**

IMPROVED FOOD PACKAGING METHOD AND FILM USED THEREIN

*Direct all correspondence to:* **CORRESPONDENCE ADDRESS**

☑ Customer Number: 23598

*OR*

| | | | | | |
|---|---|---|---|---|---|
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**ENCLOSED APPLICATION PARTS** ***(check all that apply)***

☑ Specification *Number of Pages* 8 ☐ CD(s), Number ____________

☐ Drawing(s) *Number of Sheets* ____________ ☐ Other (specify) ____________

☐ Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

☑ Applicant claims small entity status. See 37 CFR 1.27.

☑ A check or money order is enclosed to cover the filing fees.

☐ The Director is herby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 50-1170

☐ Payment by credit card. Form PTO-2038 is attached.

FILING FEE Amount ($): $80.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☑ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: ____________



*Respectfully submitted,*

SIGNATURE [signature]

Date 4/2/04

REGISTRATION NO. 32,272
*(if appropriate)*

TYPED or PRINTED NAME Andrew S. McConnell

Docket Number: 716.002

TELEPHONE 414-225-9755

***USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT***

Applicant: DAN G. SIEGEL

CERTIFICATE OF EXPRESS MAIL

This is to certify that this correspondence is being deposited with the United States Postal Service as EXPRESS MAIL - POST OFFICE TO ADDRESSEE, in an envelope addressed to Mail Stop Provisional Application, Assistant Commissioner For Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on **April 2, 2004**. The Express Mail Label No. is EV313042197US.

Dawn M. Oleszak        April 2, 2004

Dawn M. Oleszak        Date

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# FEE TRANSMITTAL for FY 2004

*Patent fees are subject to annual revision.*

[X] Applicant Claims small entity status. See 37 CFR 1.27

**TOTAL AMOUNT OF PAYMENT** ($)80.00

| Complete if Known | |
|---|---|
| Application Number | |
| Filing Date | |
| First Named Inventor | Dan G. Siegle |
| Examiner Name | |
| Group Art Unit | |
| Attorney Docket No. | 716.002 |

## METHOD OF PAYMENT *(check all that apply)*

[X] Check [ ] Credit card [ ] Money Order [ ] Other [ ] None

[ ] Deposit Account

Deposit Account Number: 50-1170

Deposit Account Name: Boyle, Fredrickson, Newholm, Stein & Gratz S.C.

**The Commissioner is authorized to:** *(check all that apply)*

[ ] Charge fee(s) indicated below [X] Credit any overpayments

[X] Charge any additional fee(s) during the pendency of this application

[ ] Charge fee(s) indicated below, except for the filing fee

to the above-identified deposit account.

## FEE CALCULATION

### 1. BASIC FILING FEE

| Large Entity Fee Code | Large Entity Fee ($) | Small Entity Fee Code | Small Entity Fee ($) | Fee Description | Fee Paid |
|---|---|---|---|---|---|
| 101 | 770 | 201 | 385 | Utility filing fee | |
| 106 | 340 | 206 | 170 | Design filing fee | |
| 107 | 530 | 207 | 265 | Plant filing fee | |
| 108 | 770 | 208 | 385 | Reissue filing fee | |
| 114 | 160 | 214 | 80 | Provisional filing fee | 80.00 |

**SUBTOTAL (1)** ($)80.00

### 2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

| | | | Extra Claims | | Fee from below | | Fee Paid |
|---|---|---|---|---|---|---|---|
| Total Claims | | -20** = | | X | | = | |
| Independent Claims | | - 3** = | | X | | = | |
| Multiple Dependent | | | | | | = | |

| Large Entity Fee Code | Large Entity Fee ($) | Small Entity Fee Code | Small Entity Fee ($) | Fee Description |
|---|---|---|---|---|
| 103 | 18 | 203 | 9 | Claims in excess of 20 |
| 102 | 86 | 202 | 43 | Independent claims in excess of 3 |
| 104 | 290 | 204 | 145 | Multiple dependent claim, if not paid |
| 109 | 86 | 209 | 43 | **Reissue independent claims over original patent |
| 110 | 18 | 210 | 9 | **Reissue claims in excess of 20 and over original patent |

**SUBTOTAL (2)** ($)0

** or number previously paid, if greater; For Reissues, see above

## FEE CALCULATION (continued)

### 3. ADDITIONAL FEES

| Large Entity Fee Code | Large Entity Fee | Small Entity Fee Code | Small Entity Fee | Fee Description | Fee Paid |
|---|---|---|---|---|---|
| 105 | 130 | 205 | 65 | Surcharge – late filing fee or oath | |
| 127 | 50 | 227 | 25 | Surcharge – late provisional filing fee or cover sheet | |
| 139 | 130 | 139 | 130 | Non-English specification | |
| 147 | 2,520 | 147 | 2,520 | For filing a request for *ex parte* reexamination | |
| 112 | 920* | 112 | 920* | Requesting publication of SIR prior to Examiner action | |
| 113 | 1,840* | 113 | 1,840* | Requesting publication of SIR after Examiner action | |
| 115 | 110 | 215 | 55 | Extension for reply within first month | |
| 116 | 420 | 216 | 210 | Extension for reply within second month | |
| 117 | 950 | 217 | 475 | Extension for reply within third month | |
| 118 | 1,480 | 218 | 740 | Extension for reply within fourth month | |
| 128 | 2,010 | 228 | 1,005 | Extension for reply within fifth month | |
| 119 | 330 | 219 | 165 | Notice of Appeal | |
| 120 | 330 | 220 | 165 | Filing a brief in support of an appeal | |
| 121 | 290 | 221 | 145 | Request for oral hearing | |
| 138 | 1,510 | 138 | 1,510 | Petition to institute a public use proceeding | |
| 140 | 110 | 240 | 55 | Petition to revive – unavoidable | |
| 141 | 1,330 | 241 | 665 | Petition to revive – unintentional | |
| 142 | 1,330 | 242 | 665 | Utility issue fee (or reissue) | |
| 143 | 480 | 243 | 240 | Design issue fee | |
| 144 | 640 | 244 | 320 | Plant issue fee | |
| 122 | 130 | 122 | 130 | Petitions to the Commissioner | |
| 123 | 50 | 123 | 50 | Processing fee under 37 CFR 1.17(q) | |
| 126 | 180 | 126 | 180 | Submission of Information Disclosure Stmt | |
| 581 | 40 | 581 | 40 | Recording each patent assignment per property (times number of properties) | |
| 146 | 770 | 246 | 385 | Filing a submission after final rejection (37 CFR § 1.129(a)) | |
| 149 | 770 | 249 | 385 | For each additional invention to be examined (37 CFR § 1.129(b)) | |
| 179 | 770 | 279 | 385 | Request for Continued Examination (RCE) | |
| 169 | 900 | 169 | 900 | Request for expedited examination of a design application | |

Other fee (specify) ____________________

*Reduced by Basic Filing Fee Paid

**SUBTOTAL (3)** ($)0

| SUBMITTED BY | | | | Complete *(if applicable)* | |
|---|---|---|---|---|---|
| *Name (Print/Type)* | Andrew S. McConnell | *Registration No. (Attorney/Agent)* | 32,272 | *Telephone* | 414-225-9755 |
| *Signature* | Andrew S. McConnell | | | *Date* | 4/2/04 |

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

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IMPROVED FOOD PACKAGING METHOD
AND FILM USED THEREIN

Inventor: Dan G. Siegel, Ph.D.

# IMPROVED FOOD PACKAGING METHOD AND FILM USED THEREIN

When certain food products, such as beef, are cut into steaks or ground into hamburger, the color of such products changes from a dull purple to bright red in a matter of minutes. The term "bloom" is used to refer to this color change. The consumer prefers the bloomed color when purchasing these food products. The bloom is caused by an oxygenation of myoglobin when the food product is exposed to the oxygen naturally present in the atmosphere. Under normal conditions, the oxygenated form of myoglobin is stable for several days, thereby maintaining the bright red color. However, after prolonged exposure to oxygen, the oxygenated form of myoglobin becomes oxidized. The oxidized form exhibits a brown color. Brown food products are considered unacceptable by the consumer, so in effect a brown food product becomes unsaleable.

In an effort to centralize the cutting of these types of food products and provide individually packaged product to the retailer, food packaging companies have designed packaging formats to attempt to extend the time that the preferred red color is exhibited by the food product. Many methods and packaging variations have been tried. The most common packaging format currently being used for this purpose is a modified atmosphere package where high oxygen content gas is flushed into the package. The elevated oxygen level in the gas causes a greater initial bloom in the food product. Other ingredients are also added to the food product to retard the oxidation of the reddened myoglobin caused by the oxygen so that the color and quality of the product lasts long enough to allow for distribution, display and sale of the product. Other packaging formats are also being developed. For example, one other packaging format that has been developed uses carbon monoxide (CO) as part of the gas that is flushed into a secondary or outer master package. The carbon monoxide penetrates the permeable inner package and affects the color of the food product in a manner similar to oxygen. However, since there is no oxygen present in the carbon monoxide to oxidize the myoglobin, the red color developed by carbon monoxide is more stable. Therefore, the red color lasts longer and does not turn brown increasing the likelihood of the sale of the product to a consumer.

The presence of oxygen in the high oxygen format causes color fading very quickly compared to the oxygen free format that utilizes carbon monoxide to cause the desirable red color. The oxygen free/carbon monoxide format requires special packaging equipment and an additional outer package to accomplish the desired effect. Therefore, it is desirable to develop a novel packaging format that creates and maintains the red display color of the meat food product and has the appearance that more closely resembles the packaging format traditionally offered to the consumer.

With this purpose in mind, the improved packaging film of this invention was discovered in experiments in which a variety of chemicals were sprayed onto raw meat prior to vacuum packaging. The chemicals used were various reducing agents and oxidizing agents, which were tested in an attempt to affect the myoglobin reducing activity and oxygen consumption rate of the raw meat. The objective was to stabilize the respiratory conditions of the meat so as to retard myoglobin oxidation after exposure to oxygen. Commonly used meat additives were evaluated as well. The chemicals included a variety of phosphates, sulfites, acids and alkalis, salts, different forms of ascorbic acid, antioxidants, oxygen sequestering agents, plant extracts such as rosemary extract, and others that are beyond the scope of, and not necessarily related to this disclosure.

In the course of these experiments, sodium nitrite was tested. It was found that very small amounts of nitrite affected the color of vacuum packaged meat. More specifically, when nitrite was coated, sprayed, dusted or otherwise applied onto the contact surface of a vacuum package, the color would turn brown immediately after evacuating oxygen away from the viewing surface. However, in some experiments the preferred red color gradually displaced the brown color and remained stable for more than 4 months.

As a result of the testing performed, it was determined that the nitric oxide (NO) gas that forms as a result of the reduction of the nitrite on the package affects the color of the food product. The nitric oxide gas has a similar effect on bloom as carbon monoxide gas. Trials when food products were contacted with nitric oxide gas found that the bloomed color caused by the nitric oxide gas occurs only in the absence of oxygen. It is the initial small amount of residual oxygen that causes browning of the food product. It was found that

when residual oxygen is high, a longer time is required for the brown color to be replaced by the preferred red color. In the initial experiments, five days were needed for the red color to fully develop. The freshness of the muscle and the specific cut affects this "bloom time" as well. Also, when a poor barrier film is used for the packaging material, the time necessary to achieve the desired bloom is extended. This is because oxygen migrates through the film and maintains the brown surface color of the meat inside.

In efforts to shorten the bloom time, extended vacuum times were used during packaging of the food product. It was observed that when a high vacuum level was applied, the bloom time decreased. With higher vacuum levels, it was also observed that when the food product surface was sprayed, dusted or otherwise coated with a water-based solution of nitrite, the bloom time could be reduced to approximately 60 hours. When the nitrite solution was sprayed, dusted or otherwise applied onto the inside surface of the package and allowed to dry before packaging the bloom time was reduced to approximately 48 hours.

The red color developed by this method is very stable, and does not turn brown during cooking. This is an issue, in that a "well done" level of preparation for the food product is hard to achieve when the nitrous oxide gas penetrates intact muscle or ground meat to depths that almost reach the center of the individual portion. Therefore, it is critical to control the level of nitrite utilized so that only enough nitric oxide gas is generated to achieve a very shallow penetration of the surface of the food product. As the depth of the nitric oxide gas penetration increases, so does the stability of the internal color to cooking temperatures that normally turn the color brown to indicate level of preparation for the food product.

In an effort to control the rate and amount of nitric oxide gas that releases from the internal film surface after packaging, it was thought that burying or impregnating the nitrite in the polymer that comprises the inner package contact surface would enable slow and controlled release. Polymer films for this purpose were prepared using 0, 1,000, 5,000, 10,000 and 25,000 parts per million of sodium nitrite. It was found that even the lowest amount of nitrite tested induced the preferred red color formation in the food product.

Accordingly, if a predetermined period of time after vacuum packaging is allowed to elapse before the nitrite contacts the food product and is reduced to form nitric oxide gas, the reducing activity of the raw food product can eliminate the small amount of residual oxygen during that period. The effect is a shortening of the bloom time.

The control of the depth of penetration of the nitric oxide gas into the food products is still an issue. Lower levels of nitrite and the manner of incorporating nitrite into the film polymer are currently being evaluated and should be able to address this issue. Future experiments are needed to optimize this characteristic of the method. The lowest levels tested so far preserved the red color for about 15 days after which the color returned to a dull purple.

In a preferred embodiment of the present invention, the invention involves adding an ingredient or ingredients such as nitrite or nitrate, and preferably sodium nitrate or sodium nitrite, to a contact meat or fish packaging film. When sodium nitrite or sodium nitrate is added to the inner layers of a multilayer packaging film, nitric oxide gas forms after the film contacts the moist food product surface. The reducing ability of the food product is sufficient to reduce the sodium nitrite or sodium nitrate to the nitric oxide gas. As the nitric oxide gas penetrates the product surface, it has a stabilizing effect on the myoglobin color that is desired for both fresh and processed food products. The best effects occur when individual portions are vacuum-packaged in a manner to have complete surface contact of the packaging film on the food product. When the method is applied to fresh meat, it causes the raw meat color to bloom to the red state that consumers prefer. Further, when this red color is achieved in a vacuum package, the shelf life of the food product is extended. The extended shelf life allows the product to age and become more tender and flavorable. Additionally, the extended shelf life enables the packer to cut and fabricate steaks or other cuts, or to produce ground meat, at a centralized location and to distribute such products to retail markets that require several days for transportation. Larger retail cuts and wholesale cuts are also well suited to the application of the method and film of the present invention.

Although the description of the invention above relates to its application to fresh red meat, this method also offers benefits when applied to cured processed meat and

fresh fish. More specifically, when the method is applied to cured processed meat, it extends the shelf life of the desired red color for the processed meat. Typically, the color of cured lunch meat fades at or about the end of its shelf life. This color fading can be attributed to the depletion of residual nitrite or nitric oxide gas. This method replenishes the residual nitric oxide gas on the meat surface, thereby extending the color life.

When the packaging film and method is applied to vacuum packaged fresh fish, it improves its bacteriological safety. Currently the safety of a low oxygen fresh fish package is at more risk than an oxygen permeable or high oxygen content package because low content oxygen packaging creates conditions that favor the growth of certain bacteria, such as Clostridium botulinum. The higher oxygen content packaging is preferred for this reason and is actually mandated by regulatory agencies. However, the presence of increased levels of oxygen also allows the faster growing bacteria to degrade the product more quickly. Nitrite and nitric oxide gas inhibit the ability of the Clostridium bacteria to produce its toxin. Therefore, its presence at the surface of a vacuum package would reduce this risk and extend the bacteriological shelf life for the fish.

Various alternative embodiments of the present invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter regarded as the invention.

# CLAIMS

I claim:

1. A multi-layer food packaging film that is generally impermeable to oxygen comprising:

a) an inner food contact layer formed of a suitable substrate or polymer capable of contacting a food item within a package formed with the multi-layer film;

b) an effective amount of a nitrogen-containing compound applied to one surface of the inner layer and capable of contacting a food item within a package formed with the multi-layer film; and

c) at least one additional layer positioned on the inner layer opposite the nitrogen-containing compound.

2. The packaging film of claim 1 wherein the food packaging film is not a barrier to oxygen.

3. The packaging film of claims 1 and 2 wherein the nitrogen-containing compound is a nitrite.

4. The packaging film of claims 1 and 2 wherein the nitrogen-containing compound is a nitrate.

5. The food packaging film of claims 1 and 2, wherein the film is adapted to vacuum package the food item.

6. A food packaging container comprising:

a) a tray adapted to hold a food item therein; and

b) a film positioned over the tray to maintain the food product therein, the film including an effective amount of a nitrogen-containing component applied to the film and adapted to be in contact with the food item held within the tray.

7. The food packaging container of claim 6, wherein the film is used to vacuum package the food item in the tray, to substantially eliminate the presence of oxygen between the film and the tray.

8. A method of packaging a food product, comprising the steps of:

a) providing a tray adapted to support the food item;

b) providing a film having a nitrogen-containing compound applied to a first surface of the film;

c) placing the food item on the tray; and

d) placing the film over the food item in the tray, thereby contacting the first surface of the film with the food item.

9. The method of claim 8 further comprising the step of evacuating the oxygen rich atmosphere gas from the tray so as to cause the film to have intimate contact with the food product surface.

# IMPROVED FOOD PACKAGING METHOD AND FILM USED THEREIN


## ABSTRACT

The present invention is a method for improving the visual appearance of a food product and a film utilized in the method. The film includes an effective amount of a nitrogen-containing compound contained within or applied to one side of the film and adapted to contact a food item held within a food packaging container. Upon contacting the food item within the container, the nitrogen-containing compound forms nitrous oxide gas within the container, which contacts the food item and causes a reddish bloom to appear on the surface of the food item. The reddish bloom is maintained on the surface of the food product for an extended period of time, thereby preserving freshness and increasing the salability of the food product to a consumer.

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